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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/049,615	02/21/2002	Hiroshi Yoshida	011362	2567
38834	7590	04/21/2004	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			SONG, MATTHEW J	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/049,615

Applicant(s)

YOSHIDA ET AL.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/9/2004 has been entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, “ the **balance** p-type single crystal zinc oxide” in line 4. It is unclear what is required to make a **balance** p-type single crystal. In other words, what is the difference between a balance p-type zinc oxide and a typical p-type zinc oxide, likewise for claim 2.

4. Claim 4 recites the limitation "doping the n-type dopant" in line 3. There is insufficient antecedent basis for this limitation in the claim.

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5. Claim 1-2 recites the limitation "the balance p-type single crystal" in line 5 of claim 1 and line 7 of claim 2. There is insufficient antecedent basis for this limitation in the claim.

### *Double Patenting*

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1-2 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of U.S. Patent No. 6,527,858 in view of Applicants Admitted Prior Art (Admission).

US 6,527,858 claims a p-type ZnO single crystal comprising a zinc oxide that contains a p-type dopant composed of nitrogen or carbon and an n-type dopant composed of any one or more elements selected from a group consisting of boron, aluminum, and gallium. US 6,527,858 also claims the hole concentration is  $1 \times 10^{17}$  holes/cm<sup>3</sup> or more and the electric resistivity is lower than 100 ohm-cm.

US 6,527,858 does not claim a ferromagnetic p-type consisting of 1-99% manganese.

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Admission teaches to achieve a ferromagnetic state with a high ferromagnetic transition temperature by doping Mn into ZnO, it is required to heavily dope a hole (p-type carrier) having an interactional function for ferromagnetically uniform the spin in Mn doped into ZnO being a wide-gap semiconductor. Admission also teaches a single crystal ZnO doped with Mn having a high ferromagnetic transition temperature enables high density magnetic recording medium capable of transmitting larger amounts of information. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the heavily doped p-type ZnO single crystal with Admission method of doping Mn into a ZnO crystal because a ZnO film doped with Mn can be used as a high-density magnetic recording medium.

The combination of US 6,527,858 and Admission does not teach the concentration of manganese is 1-99 mol%. Concentration is well known in the art to be a result effective variable. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of US 6,527,858 and Admission by optimizing the amount of manganese to obtain the claimed concentration by conducting routine experimentation of a result effective variable (MPEP 2144.05). Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)).

The combination of US 6,527,858 and Admission teaches a hole concentration of  $1 \times 10^{17}$  holes/cm<sup>3</sup> or more and the electric resistivity is lower than 100 ohm-cm. Overlapping ranges are held to be obvious (MPEP 2144.05).

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8. Claims 3-4 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of U.S. Patent No. 6,527,858 in view of Applicants Admitted Prior Art (Admission), as applied to claims 1-2 above, and further in view of Schetzina (US 5,679,965).

The combination of US 6,527,858 and Admission teaches all of the limitations of claim 3, as discussed previously, except the operating parameters of a substrate held within a temperature range of 300-800°C in a vacuum atmosphere of about  $10^{-8}$  Torr and the partial pressure of the reactants.

In a method of growing ZnO, Schetzina teaches a substrate is held between 300-900°C for monocrystalline growth of ZnO using MBE (col 19, ln 1-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of US 6,527,858 and Admission with Schetzina's teaching of a substrate temperature of 300-900°C to produce an expected result.

The combination of US 6,527,858, Admission and Schetzina is silent to the pressure and partial pressure. Pressure and partial pressure of reactants are well known in the art to be result effective variables. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of US 6,527,858, Admission and Schetzina by optimizing the pressure and partial pressure to obtain the claimed pressure and partial pressure by conducting routine experimentation of result effective variables (MPEP 2144.05).

***Response to Arguments***

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9. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Fuji (JP 07-288259) teaches a molecular beam epitaxy of a Group II-VI semiconductor using a chamber pressure of  $10^{-7}$ - $10^{-9}$  Torr (English Abstract and [0008]).

Forbes et al (US 6,498,362) teaches a ferroelectric film comprising ZnO doped with manganese (Abstract).

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song  
Examiner  
Art Unit 1765

MJS

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**  
*Nadine*